Gender, Negative Emotionality, and Cannabis Use Frequency: The Mediational Role of Cannabis Use Motives

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Abstract

Cannabis use is pervasive worldwide and a number of users experience adverse psychosocial consequences. Understanding the cognitive mechanisms underpinning problematic cannabis use is crucial to informing preventative and treatment initiatives for those who experience or are vulnerable to cannabis related problems. The aim of the present study was to examine cannabis motives and expectancies held amongst a community-based sample of 384 adult cannabis users living in Aotearoa, New Zealand. Through a moderated mediational model, the extent to which cannabis cognitions mediated the relationship between negative emotionality and cannabis use frequency was tested, followed by whether gender moderated the identified mediational relationships. Mean comparisons of male and female participants pattern of cannabis use was largely similar however, males reported significantly more attempts to quit using cannabis and females reported higher rates of negative emotionality and motivations to use cannabis to reduce negative affect. Mediation analysis revealed a significant direct effect of negative emotion on cannabis use frequency through negative affect reduction motives for both men and women. Gender was not found to moderate the identified mediation relationships. Results suggest that the pathway between negative emotion, negative affect reduction motives, and cannabis frequency is similar for both men and women however, negative emotionality and motivations to reduce negative affect appear especially relevant to female cannabis use patterns.

Gender, Negative Emotionality, and Cannabis Use Frequency: The Mediational Role of Cannabis Use Cognitions

Introduction

Cannabis is the most commonly used illicit substance worldwide, with rates of use having increased over the last decade (United Nations Office on Drugs and Crime, 2016). Due to its widespread use, the experimental use of cannabis is argued to be a normative experience especially during the adolescent developmental period (Fergusson & Horwood, 2000). Most individuals desist cannabis use once adulthood is reached incurring few long-term consequences (Brodbeck, Matter, Page, & Moggi, 2006). However, growing recognition has been given to cannabis use during adulthood, with research suggesting that a rising number of adults are continuing to use cannabis or to initiate use during later stages of life (Currin et al., 2018; Lev-Ran et al., 2011) Furthermore, a proportion of individuals who use cannabis develop more harmful using patterns, as a result, experiencing a range of adverse psychosocial consequences that can continue well past the adolescent developmental period (Buckner & Schmidt, 2008). Due to high prevalence rates, cannabis use constitutes a large proportion of global drug treatment demand (Benschop et al., 2014). Understanding the factors associated with problematic cannabis use is crucial to informing preventative and treatment initiatives.

Cannabis Use Motives

Substance use motives are cognitive mechanisms that have received research attention in the pursuit of understanding risks and maintenance factors associated with problematic cannabis use (Buckner, 2013). Motivational models of substance use are based on the theory that an individual consciously or unconsciously decides to consume a substance according to whether they expect the consequences of using are more advantageous than not using (Terry-McElrath, O'Malley, & Johnston, 2009). The majority of research on motivational models of

substance use has focused on alcohol with four main motive dimensions being established. These motives include enhancement of positive mood, enhancement of social experiences, to cope or reduce negative affect, and social conformity (Kuntsche & Kuntsche, 2009). A number of studies in the alcohol field have consistently found that certain motive dimensions are related to specific alcohol consumption patterns with social motives being linked with moderate alcohol consumption, enhancement motives linked with heavy consumption, and coping motives linked with problematic or harmful consumption patterns (Cooper, Russell, & George, 1988; Kuntsche, Knibbe, Engels, & Gmel, 2010).

In order to more comprehensively understand the motives for cannabis use specifically, Simons, Correia, Carey, and Borsari (1998) modified an alcohol questionnaire to measure cannabis use motives. Five different motives for using cannabis were distinguished; enhancement of mood/experience, social facilitation, affective coping, social conformity, and expansion motives. Expansion motives can be defined as the expansion of awareness, perception, and sensations that are induced while under the influence of cannabis (Phillips, Lalonde, Phillips, & Schneider, 2017).

Endorsement of specific motives has been linked with how frequent cannabis consumption occurs (Foster, Jeffries, Zvolensky, & Buckner, 2016). Simons, Correia, and Carey (2000) found that social and coping motives predicted higher frequency of cannabis use among first year college students. Another study which looked at cannabis motives among a community sample of Swiss young adults who acknowledged regular cannabis use, found that those who endorsed coping motives used cannabis more frequently than those who reported alternative cannabis motives (Brodbeck et al., 2006). Further, research conducted in the United States by Lee, Neighbors, and Woods (2006) examined motives among college students in relation to cannabis use patterns and consequences. They found that cannabis motives related

to experimentation and social facilitation were related to decreased use, whereas motivation to use cannabis to improve sleep, cope with boredom, cope with negative affect, seeing cannabis as low risk, and altered perceptions, were positively associated with greater frequency of use.

Cannabis Use Expectancies

Substance use expectancies are another cognitive mechanism of influence that has informed knowledge regarding substance use patterns (Guillem et al., 2011). Substance use expectancies can be defined as the "anticipatory cognitions regarding the perceived outcomes of use" (Harty, Pedersen, Gnagy, Pelham, & Molina, 2015. p. 1471). Consistent with Social Learning Theory (Bandura, 1979), substance use expectancies are believed to exist before the first consumption and evolve as part of the normal learning process (Schafer & Brown, 1991). Substance use expectancies include beliefs and attitudes towards substance use that result from a diverse range of sources including social norms and influence, perceived effects of substances in others, and actual substance use experience and expectations, that are reciprocally reinforced or modified after substance use exposure (Pedersen et al., 2015; Schafer & Brown, 1991).

Although expectancies appear largely similar to motives, they can be differentiated (Hasking, Lyvers, & Carlopio, 2011). Motives or reasons for using substances refer to what propels an individual to use substances and are conceptualised as more proximal cognitions to substance use than expectancies (Galen, Henderson, & Coovert, 2001). Motives are held exclusively by cannabis users and generally comprise of desirable outcomes (Hasking et al., 2011). Cannabis expectancies however, can be held by both users and non-users and be comprised of both desirable and undesirable outcomes (Laurent, Catanzaro, & Callan, 1997). Although many studies group substance use expectancies and motives together, other research acknowledges the value of differentiating motives and expectancies in order to more

comprehensively examine and understand the cognitive pathways to cannabis use (Foster, Zvolensky, Garey, Ditre, & Schmidt, 2014).

Similar to motives, expectancy research is well established in the alcohol literature with an increasing amount of research focussed on cannabis and cannabis use expectancies. Research by Schafer and Brown (1991) extended substance expectancy research by assessing expectancies related to cannabis. They found that cannabis expectancies overlapped considerably with those of alcohol and had a powerful effect on cannabis use frequency. In particular, positive cannabis expectancies, characterised by expecting cannabis use to result in positive or arousing effects, was associated with higher frequency of use. Conversely, negative cannabis expectancies, characterised by expecting cannabis use to result in negative or aversive effects, was associated with non-use or decreased use of cannabis (Schafer & Brown, 1991).

Subsequent research on cannabis expectancies has replicated the earlier findings of Schafer and Brown (1991), confirming the association between positive cannabis expectancies and increased frequency of cannabis use (Buckner & Schmidt, 2008; Guillem et al., 2011; Hayaki, Hagerty, et al., 2010). Furthermore, research has found that cannabis users who hold largely positive cannabis expectancies were more susceptible to becoming dependent and experiencing cannabis related problems (Foster, Jeffries, et al., 2016). Positive cannabis expectancies have also been associated with the increased likelihood of initiating cannabis use amongst adolescent non-users (Malmberg et al., 2011; Schmits, Mathys, & Quertemont, 2015). Conversely, negative cannabis expectancies have been found to be protective against the initiation of cannabis use amongst non-users (Foster, Jeffries, et al., 2016). Different expectancies have also been found to influence the success of treatment outcomes. Research conducted on a clinical sample found that participants who endorsed negative expectancies tended to have better lapse/relapse associated outcomes than those low in negative expectancies

(Boden, McKay, Long, & Bonn-Miller, 2013). Such research elucidates the different motivational and cognitive processes underpinning an individual's cannabis use which, in turn, is associated with different cannabis related outcomes.

Negative Emotionality and Cannabis Use Patterns

A person's experience of negative emotionality and ability to tolerate distress appears particularly pertinent in the development and maintenance of harmful cannabis use (Lee et al., 2006). A growing amount of research has linked distress intolerance and negative emotional states to increased cannabis related problems including higher frequency of cannabis use, greater risk of developing a substance use disorder, and a greater risk of relapse (Bujarski, Norberg, & Copeland, 2012; Fergusson, Horwood, & Swain-Campbell, 2002; Schmits et al., 2015). Other research has found that cannabis users who demonstrate variations in affect lability such as frequency, speed, and changes in affective states tend to experience increased cannabis related problems (Bonn-Miller, Vujanovic, & Zvolensky, 2008; Simons & Carey, 2006). Research that explores the cognitive processes that may underpin this established link between negative emotionality and cannabis use problems helps build the theoretical and empirical understanding of the cognitive mechanisms relevant in this relationship (Bonn-Miller et al., 2008).

A small amount of research has explored the role motivations and expectancies have in the relationship between negative emotionality and increased cannabis use/cannabis related problems (Brodbeck et al., 2006; Buckner & Schmidt, 2009; Bujarski et al., 2012; Foster, Jeffries, et al., 2016). Research conducted by Brodbeck et al. (2006) analysed the motives of cannabis using young adults living in the community and a comparison group of non-users. They found that cannabis users who endorsed emotional coping motives showed lower mental health, more symptoms of psychopathology, more psychosocial distress, and more negative

life events compared to non-users. Cannabis users who endorsed social motives, however, did not differ from non-users in their levels of psychosocial distress. The differences found between cannabis users who hold either social or coping motives remained stable over a two year follow up period (Brodbeck et al., 2006).

Additional research has further demonstrated the influential role of cannabis use cognitions on cannabis outcomes. Research by Buckner and Schmidt (2009) found that emotional coping motives mediated the relationship between anxiety sensitivity and the increased risk of developing cannabis dependence amongst established cannabis users. Similarly, research conducted by Bujarski et al. (2012) found that coping motives mediated the relationship between distress intolerance and cannabis related problems amongst a sample of adult cannabis users. Furthermore, research by Martens and Gilbert (2008) demonstrated that higher cannabis use frequency was associated with negative affect reduction expectancies regardless of the duration of time a person had used cannabis. Such research suggests that when taking cannabis cognitions into consideration, a moderating effect exists, such that cannabis users who endorse coping motives and expectancies tend to be at increased risk of experiencing adverse psycho-social consequences related to cannabis use.

Negative Emotionality and the Acquired Preparedness Model

The acquired preparedness model (APM; Smith, Anderson, Monti, Colby, & O'Leary) is a model that has been applied and tested in regards to the mediational role substance use expectancies have between predisposed personality traits and the development and maintenance of problematic cannabis use (Curry et al., 2018). The APM integrates personality and social learning by proposing that individuals who have certain personality traits are predisposed (prepared) to learn (acquire) certain substance use beliefs and expectations, which in turn influence their behaviour (Hayaki, Herman, et al., 2010).

Previous research that has applied the APM to cannabis use patterns has validated the model, demonstrating that positive expectancies either fully or partially mediate the effect of disinhibition, impulsivity, and sensation seeking on more problematic cannabis use outcomes (Curry et al., 2018; Hayaki, Herman, et al., 2010). Research by Hayaki, Herman, et al. (2010) found a positive mediational effect for positive cannabis expectancies between impulsivity/disinhibition and cannabis use outcomes amongst a sample of community based female cannabis users. Another study by Curry et al. (2018) found that positive cannabis expectancies mediated the association between sensation seeking and adverse cannabis outcomes amongst high risk young adults.

Negative emotionality may be another predisposed attribute that could increase the likelihood of an individual acquiring particular cannabis use expectancies, which in turn, may influence maladaptive cannabis use behaviours. To our knowledge, no prior research has explored how the APM could be applied to negative emotionality, cannabis cognitions and subsequent cannabis use outcomes. The APM could be a useful theoretical model to conceptualise the relationship between negative emotionality, cannabis use cognitions, and cannabis use outcomes.

Gender and Cannabis Use Outcomes

Limited research has investigated whether certain subgroups of users may be more vulnerable to experiencing cannabis related problems. Gender differences in cannabis use cognitions and negative emotionality is an area that warrants further research exploration particularly considering the gender differences apparent in cannabis use outcomes and patterns of use.

Traditionally, cannabis use has been characterised by higher male prevalence compared to females (McHugh, Votaw, Sugarman, & Greenfield, 2018). Furthermore, men have higher rates of cannabis use over time and tend to initiate cannabis use at a younger age (Sherman, Baker, & McRae-Clark, 2015; Wagner & Anthony, 2006). Research over the last two decades, however, has revealed that the prevalence gap between male and female cannabis use appears to be narrowing, with female use having increased significantly (Hayaki, Hagerty, et al., 2010). Moreover, a longitudinal study examining gender differences in cannabis use found that female cannabis use peaked during early adolescence and exceeded male rates during this period (Chen & Jacobson, 2012). Although, overall, male rates of use remain higher than females, the frequency of female-initiated cannabis use is increasing (Chen & Jacobson, 2012; McHugh et al., 2018). This in turn has seen a growing number of females represented amongst those meeting diagnostic criteria for cannabis use disorder (Wagner & Anthony, 2006).

Cannabis use does not affect males and females equally. Consistent gender differences in cannabis related biological, psychological, and social outcomes have been repeatedly demonstrated (Keyes et al., 2011; Lac et al., 2011; Ottosen, Petersen, Larsen, & Dalsgaard, 2016; Sherman et al., 2017). New Zealand longitudinal research found that men were twice more likely than females to develop dependence on cannabis (Fergusson et al., 2002). Symptoms of depression have also been found to be more associated with higher cannabis use frequency for males than for females (Crane, Langenecker, & Mermelstein, 2015).

Although female cannabis users tend to use less frequently than their male counterparts, females are at greater risk for adverse mental, physical, and social consequences of cannabis use compared to males (Chung, Kim, Hipwell, & Stepp, 2013). Female cannabis users show quicker cannabis abuse related potential, demonstrating a ‘telescoping’ effect, progressing from first use, to disorder, and treatment entry more rapidly than men (McHugh et al., 2018;

Sherman et al., 2015). This telescoping effect has been linked with the gender differences observed in the endocannabinoid system, the brain structures responsible for metabolising cannabis (Calakos, Bhatt, Foster, & Cosgrove, 2017). Moreover, female cannabis users are more likely to experience greater withdrawal severity and higher rates of psychiatric comorbidity (McHugh et al., 2018). Amongst cannabis users meeting criteria for cannabis use disorder, females have more significant adverse effects on self-reported mental health and quality of life compared to males (Lev-Ran et al., 2011).

The cited research highlights consistent gender differences relevant to the initiation, course, and treatment of cannabis use. Understanding the underlying mechanisms relevant to these gender differences becomes crucial to identifying the differential risk factors associated with cannabis related harm for males and females (Sherman et al., 2017).

Gender, Cannabis Use Motives and Expectancies

Despite gender differences in cannabis use outcomes being evident, research that has analysed gender differences in substance use motives and expectancies is limited. A number of studies have suggested that women's motives for using cannabis are more likely to be related to reducing negative affect, relieving tension, and coping with mood disturbances (Bujarski et al., 2012; de Dios et al., 2010; McHugh et al., 2018; Simons et al., 1998; Terry-McElrath et al., 2009). Conversely male cannabis users are more likely to report their reasons for using cannabis to be related to seeking deeper insights and understanding or using for social and recreational reasons (Terry-McElrath et al., 2009). Research on a clinical sample of cannabis users, found that the experience of negative affect was one factor that contributed to relapse amongst females while experience of positive affect was more relevant to relapse for men (Hodgins, el-Guebaly, & Armstrong, 1995). Furthermore, research that found that the relationship between distress intolerance and increased cannabis related problems was

mediated by coping motives, found that this effect was more powerful for female cannabis users than men (Bujarski et al., 2012). Interestingly, Buckman, Yusko, Farris, White, and Pandina (2011) found that males were more likely than females to use cannabis to cope with negative emotions associated with depression and anxiety.

Fewer studies have specifically focussed on gender differences in cannabis use expectances. One study examined the role of cannabis use expectancies amongst a community sample of female cannabis users finding that tension reduction expectancies significantly mediated the relationship between anxiety symptoms and overall cannabis use (de Dios et al., 2010). Similarly, research by Hayaki, Hagerty, et al. (2010) found in their sample of community-based female cannabis users that relaxation and tension reduction expectancies were a robust predictor of both cannabis use frequency and severity. To our knowledge, no identified studies have compared the differences in male and female cannabis expectancies within one sample, highlighting the need for further research in this area.

The above research suggests important gender differences in the predictors of cannabis use outcomes, raising the possibility that there may be different mechanisms propelling cannabis use among men and women. Further research into gender differences in expectancies and motives amongst cannabis users is necessary to further inform the underlying mechanisms relevant to cannabis use. This in turn, would assist prevention and treatment efforts by providing gender responsive strategies and techniques that consider the different vulnerability factors relevant to male and female cannabis users.

The Current Study

The aim of the present research study was to examine cannabis motives and expectancies held amongst a non-clinical sample of adult cannabis users living in Aotearoa New Zealand. By conducting research with adult cannabis users living in the community, this

study will contribute to knowledge in this topic area for cannabis users outside of the adolescent age group and clinical setting, where the majority of research on this topic has been conducted (Foster, Buckner, Schmidt, & Zvolensky, 2016). Furthermore, the current study will contribute to the understudied area of gender differences in cannabis expectancies and motives (Bujarski et al., 2012; Sherman et al., 2017).

The current research will explore gender differences in cannabis related outcomes such as cannabis use frequency, quit attempts, age of first use, emotional problems, and stress. These outcome measures were chosen as indicators of cannabis use severity. This study will also explore gender differences in cannabis use expectancies and motives. Finally, the relationship between negative emotionality, negative affect reduction cannabis use cognitions, and cannabis use will be explored as well as the moderating role of gender on this pathway.

Based on previous research, it is expected that, compared to female participants, males will report a more severe pattern of cannabis use as indicated through higher rates of cannabis use frequency, increased quit attempts, an earlier age of onset, and an earlier age of commencing regular cannabis use. However, it is expected that female participants will report higher levels of negative emotionality compared to their male counterparts.

In regard to cannabis use expectancies and motives, based on previous literature it is expected that male relative to female cannabis users will endorse higher rates of expectancies and motives related to Perceptual and Cognitive Enhancement. Female cannabis users however, are anticipated to endorse increased rates of expectancies and motives related to Negative Affect Reduction and Relaxation and Tension Reduction compared to male cannabis users.

It is hypothesised that increased negative emotionality will be associated with cannabis use frequency. Further, it is hypothesised that the relationship between negative emotionality

and cannabis use will be partially explained by negative affect reduction cannabis cognitions. While exploratory, based on the current literature, it is expected that gender will moderate the relationship between negative emotionality and negative affect reduction cognitions, as well as the relationship between affect reduction cognitions and cannabis use.

Method

Participants

The online questionnaire was completed by 500 self-reported cannabis users over the age of 18 who lived in New Zealand. Selection criteria for the current study was limited to survey responders between the ages of 18 and 34 which comprised of 74 percent of the original sample. In total, there were 384 participants included in the current study with 67 percent of participants falling into the age bracket of 18 to 24. Of this sample, 247 participants identified as male, 137 identified as female, and one survey responder indicated non-binary gender identification. It was decided to exclude the one survey responder who identified as non-binary gender because any conclusions drawn from data analysis would be invalid for this population group due to lack of numbers. Participants were permitted to indicate identification with more than one ethnic group. Ethnic identification of participants primarily consisted of New Zealand European comprising 77.1% of the sample. This was followed by 12.2% of participants identifying as New Zealand Māori. Education status of participants consisted of 21.9% having completed secondary school achieving university entrance or equivalent. 26.8% of participants had achieved some tertiary credit, and 24.5% had completed tertiary education to a Bachelor's degree level. 9.4% of participants indicated training of technical, vocational or trade. Less than five percent of the sample indicated that they had not completed high school.

The study was approved by the University of Canterbury Research Ethics Committee. Participants were recruited through the placement of advertisements (see Appendix A) within online social media groups that promoted cannabis use in New Zealand. Physical copies of the advertisements were placed in targeted locations across different suburbs of varying socio-economic status within Christchurch, New Zealand. These locations included the University of Canterbury campus, community libraries, and waiting rooms of General Practitioner practices. Participants indicated their consent to partake in the study prior to commencing the questionnaire (see Appendix D).

Measures

Substance Use: Participants were asked to rate the frequency of their current cannabis use via a Likert scale ranging from one to six with one representing cannabis use frequency of less than once a month, and six which indicated daily cannabis use. Separate items assessed participant's current alcohol, tobacco, and use of other recreational drugs employing the same Likert rating scale. Participants were asked the age they first began smoking cannabis, the number of years they had been smoking cannabis, the age they began using cannabis regularly, the number of times they had attempted to quit using cannabis, and whether they identified as a regular cannabis user (see Appendix C).

Cannabis Use Expectancies: Information regarding participant's cannabis use expectancies were gathered through the administration of four subscales of the Marijuana Effect Expectancy Questionnaire (MEEQ). The MEEQ is a widely used measure of cannabis expectancies with good psychometric properties (Aarons, Brown, Stice, & Coe, 2001). The four scales used in the current study were Cognitive Behavioural Impairment (i.e. "Marijuana causes me to lose control and become careless"), Perceptual and Cognitive Enhancement (i.e. "I become more creative or imaginative when I am on marijuana"), Global Negative Effects

(i.e. “Marijuana tastes and smells bad”), and Relaxation and Tension Reduction (i.e. “I get a sense of relaxation from smoking marijuana”). Participants indicated their response to the 34 items through a 5-point Likert scale with one representing “disagree strongly” up to five which represented “agree strongly”.

Cannabis Use Motives: Motive data was gathered via the Marijuana Response Questionnaire (MRQ. Harty & Lowden, 2019). The MRQ is a validated questionnaire developed for the current study and is based on the Situation x Trait Adaptive Response questionnaire (STAR. Gilbert, Sharpe, Ramanaiah, Detwiler, & Anderson, 2000). The MRQ is made up of 47 items and assesses participant’s cannabis use in relation to how often they smoked cannabis in response to varying situations outlined in each item. The MRQ consists of the three subscales; Cognitive Enhancement (i.e. “I smoke marijuana when I want to think more clearly”), Negative Affect Reduction (i.e. “I smoke marijuana when I feel sad”) and Pleasure Enhancement (i.e. “I smoke marijuana when I am feeling good”). Participants were asked to indicate their response via a 5-point Likert scale from “Never” to “Very Often”.

Stress and Reactivity: Participant’s reactions to stressful situations was measured by the Reactivity to Work Overload subscale of the Perceived Stress Reactivity Scale (PSRS. Schlotz, Yim, Zoccola, Jansen, & Schulz, 2011). The PSRS is a widely used and well validated questionnaire used to measure individual’s reactions to stressful life events. The Reactivity to Work Overload subscale of the PSRS comprised of five questionnaire items. This scale was chosen for the current study as it effectively captures participant’s sense of experiencing negative emotions such as feeling overwhelmed in response to tasks. Each item asked participants to choose between three different responses that most closely related to their experiences. The following is an example item of the PSRS; “When something does not go the

way I expected…", "I usually stay calm", "I often get uneasy", or "I usually get very agitated". Higher scores reflect higher perceived stress.

Irritability: The Affective Reactivity Index: self-report version (ARI) was used to assess participant's levels of irritability. The ARI has demonstrated good psychometric properties and is approved for clinical and research purposes (Stringaris et al., 2012). The ARI is a concise dimensional measure of irritability consisting of seven items. An example of an item in the ARI included "I often lose my temper". Participants were asked to rate the degree to which each item was "not true", "somewhat true" or "certainly true" for them.

Executive Functioning: The Barkley Deficits in Executive Functioning Scale: Self-Report Short Form (BDEFS for Adults) was used to assess participant's executive functioning in daily life. The BDEFS is an empirically based and well validated tool for evaluating dimensions of adult executive functioning and how they manifest in everyday life (Allee-Smith, Winters, Drake, & Joslin, 2013). The measure consists of 20 items which provide an overall composite score as well as five subscale scores measuring levels of self-management, organisation, motivation, self-restraint, and of specific interest to this study, emotional regulation capacities in everyday life. Items require participants to indicate the response that best describes their behavior over the last 6 months via a 4-point Likert scale ranging from one representing "never or rarely" up to four representing "very often".

Procedure

Individuals who were interested in participating in the study were directed via the study advertisement to the provided Qaultrics web address associated with the study. Qualtrics was the online survey platform used to facilitate participant's completion of the survey. Participants completed the questionnaire in a location of their choosing using their own, or available chosen device. Prior to starting the survey, potential participants were presented with an information

sheet detailing the study aims and interests, how their information would be handled, and the potential risks and benefits associated with participating in the study (see Appendix E). Individuals were then provided with a consent from and invited to provide their personal email address to signal their consent to partake in the study (see Appendix D). As an incentive, participants were given the option to submit their contact details as part of the consent form to enter a prize draw to win one of $100 gift vouchers. Participants were assured that their contact details would not be linked to survey answers and would be kept confidential. Participants were then presented with the demographic questions of the study (see Appendix B), followed by all other questionnaire items. The study took approximately 15 minutes to complete.

Following the completion of the questionnaire, participants were thanked for their time and reminded of when they could expect to hear about the lucky draw if they opted to enter this. Prior to statistical analysis, all survey data was de-identified and randomly assigned an alpha numeric ID provided through Qualtrics. Qualtrics has its own secure system in which participant data was collected and securely stored. Research data was kept confidential with access password protected and only accessible by those within the research team.

Data Analysis

A series of independent sample t tests were conducted to explore mean differences between male and female participants reported experience of negative emotionality as measured by levels of stress, irritability, and executive functioning. Further group comparisons were conducted to explore differences between male and females reported cannabis use severity as measured by frequency of use, age of first use, and age when regular use commenced. Mean differences between male and females cannabis use expectancies and motives were also analysed. Cohens d was calculated to assess the effect sizes of identified differences between male and female participants on the described measures.

Based on the above group comparisons, a mediation analysis was conducted to examine the degree to which cannabis use cognitions explained the relationship between self-reported emotionality and cannabis use frequency. Additional analyses examined the extent to which gender moderated these mediational pathways (See Figure 1).

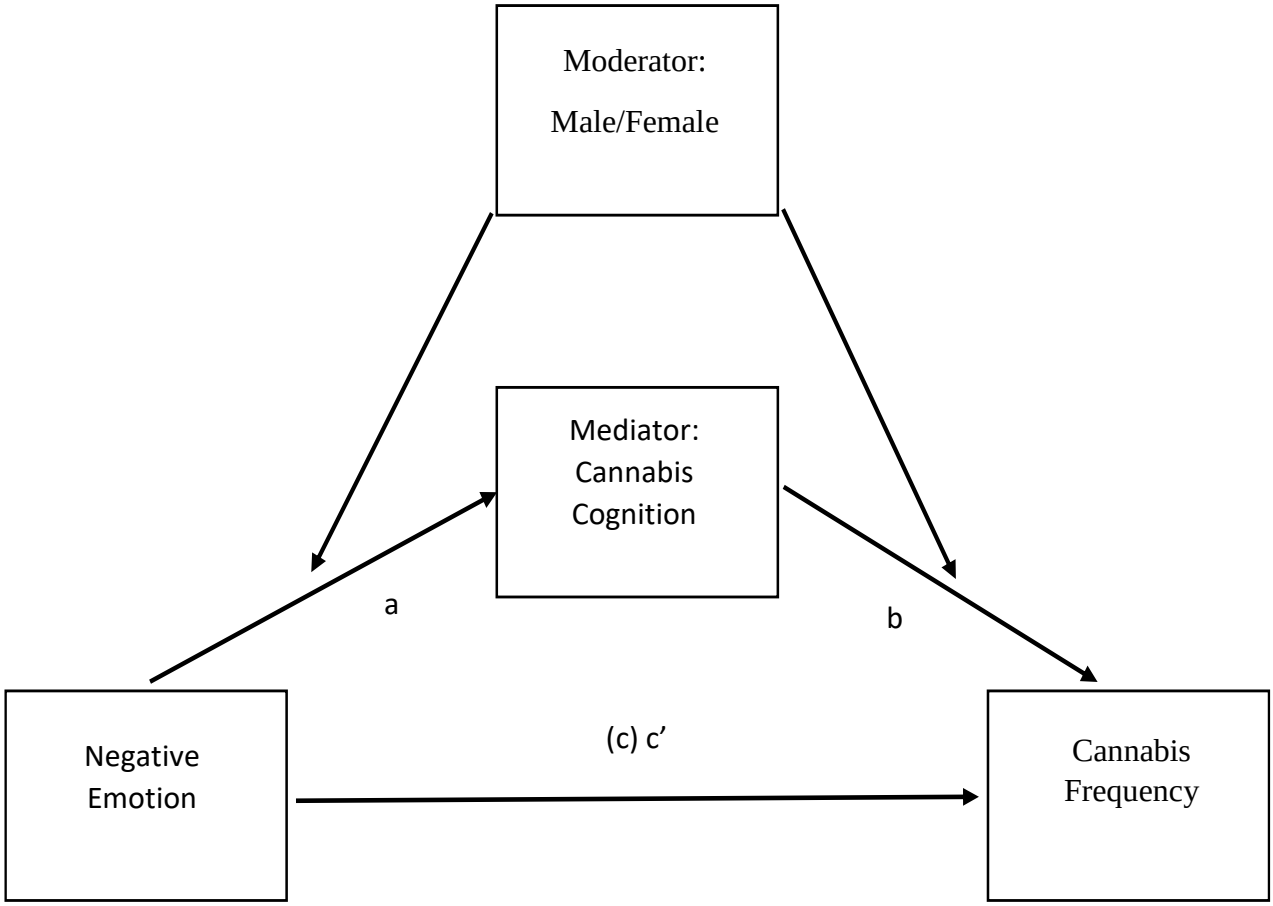

Figure 1. Moderated-Mediation Model for the Relationship Between Negative Emotion and Cannabis Frequency through Cannabis Cognitions as Moderated by Gender.

All data were analysed using IBM SPSS Statistics version 25.0. Tests of mediation and moderation were conducted using the PROCESS macro for SPSS (Hayes & Preacher, 2014). For mediation analyses, this procedure produces path coefficients along with *p* values for the

total (*c*) and direct effects (*c'*), along with the estimate of the indirect effect (*ab*). A true indirect effect is considered to fall within the 95% confidence interval (CI). A CI that does not include zero can be taken as evidence that the indirect effect is different from zero at $p < .05$. As recommended by Hayes & Preacher (2010), 5,000 bootstrap samples were taken to estimate the indirect effect and 95% bias-corrected CIs. All predictors were mean-centred.

Results

Cannabis Alcohol and Drug Use

A summary of male and female participants mean comparisons of cannabis, alcohol and recreational drug use outcomes is presented in Table 1. Male and female participants reported similar rates of cannabis use across most measures. For both male and female participants, frequency of cannabis use was reported as multiple times per week. Male participants did report a significantly higher number of quit attempts. The magnitude of this difference however was small. Compared to females, male participants reported significantly higher rates of alcohol use with a medium effect.

Table 1

Mean Comparisons of Male and Female Cannabis, Alcohol and Drug Use

	Male *M(SD)*	Female *M(SD)*	*t*	*p*	*d*
Current Smoking	2.50(1.21)	2.71(1.20)	-.927	.356	.17
Current Alcohol	3.01(1.20)	2.56(1.18)	3.18	.002**	.38
Current Cannabis	4.47(1.72)	4.21(1.76)	1.41	.159	.15
Current Drugs	1.30(.58)	1.29(.64)	.132	.895	.02
Onset Marijuana	16.21(2.41)	16.67(2.81)	-1.69	.092	.18
Age regular use	18.75(3.80)	19.06(3.51)	-.737	.461	.08
Quit attempts	1.79(1.56)	1.42(.98)	2.79	.006**	.28

M = mean, *SD* = Standard deviation
***$p < .001$
**$p < .01$
* $p < .05$

Irritability, Stress and Executive Functioning

A summary of male and female mean comparisons of irritability, stress, and executive functioning in daily life is presented in Table 2. Between group comparisons revealed that female participants reported significantly more stress than males. Also, female participants reported significantly more difficulties in overall executive functioning. Analysis of the BDEFS subscales revealed females reported significantly more difficulties with emotion regulation, time management, and organisation. As can be seen in Table 2, significant comparisons resulted in small to medium effect sizes with the largest effects being seen on measures of negative emotion and emotion regulation. No significant differences between male and female participant's levels of irritability, motivation, or self-restraint, were found.

Table 2

Mean Comparisons of Male and Female Irritability, Stress, and Executive Functioning in Daily Life

	Male *M(SD)*	Female *M(SD)*	*t*	*p*	d
Irritability	1.23(.3)	1.28(.34)	-1.52	.130	.16
Stress	1.52(.45)	1.83(.49)	-6.10	<.001***	.66
Executive Functioning	32.25(8.87)	34.91(10.59)	-2.40	.017*	.27
Self-Management	8.45(2.7)	9.09(3.1)	-2.00	.045*	.22
Self-Organisation	5.55(2.06)	6.04(2.37)	-2.04	.042*	.22
Self-Restraint	5.95(2.03)	5.89(2.07)	.267	.790	.03
Self-Motivation	6.34(2.46)	6.49(2.93)	-.473	.637	.06
Self-Regulation	5.96(2.72)	7.40(3.35)	-4.13	<.001***	.47

M = mean, *SD* = Standard deviation
***$p < .001$
**$p < .01$
* $p < .05$

Cannabis Motives and Expectancies

A summary of male and female mean comparisons of cannabis motives and expectancies is presented in Table 3. Mean comparisons of male and females reported cannabis use motives and expectancies revealed that female cannabis users endorsed motivations to use cannabis to reduce negative affect significantly more than males, producing a small effect size. No other significant differences between male and female participants motivations and expectancies were identified.

Table 3

Male and Female Mean Comparisons of Cannabis Expectancies and Motives

	Male *M(SD)*	Female *M(SD)*	*t*	*p*	d
Cognitive Behavioural Impairment (MEEQ)	29.29(8.51)	29.93(8.49)	-.66	.510	.08
Relaxation and Tension Reduction (MEEQ)	30.24(6.11)	31.11(450)	-1.46	.145	.16
Perceptual and Cognitive Enhancement (MEEQ)	27.95(4.53)	28.13(4.68)	-.356	.722	.04
Negative Affect Reduction (MRQ)	2.29(1.10)	2.63(1.11)	-2.63	.009*	.31
Pleasure Enhancement (MRQ)	3.67(.91)	3.73(.73)	-.705	.481	.07
Cognitive Enhancement (MRQ)	2.14(.86)	2.08(.83)	.633	.53	.07

M = mean, *SD* = Standard deviation
***$p < .001$
**$p < .01$
* $p < .05$

Mediation analysis

Based on the above results, two mediation analyses were conducted testing the relationship between measures of emotional regulation (PSRS Stress, and BDEFS Emotion Regulation) and cannabis use frequency as mediated by Negative Affect Reduction motives. There was a direct effect (*c'*) of PSRS Stress on cannabis use frequency $b = -1.08$, $t\ (297) = -6.10$, $p < .001$, CI: -1.43- -0.73. Analysis of the mediational pathway revealed that stress was positively associated with Negative Affect Reduction motives, (*a*), $b = 0.27$, $t\ (297) = 2.40$, $p = .02$, CI: 0.05- 0.49, and Negative Affect Reduction motives were positively associated with cannabis use frequency, (*b*), $b = 0.88$, $t\ (297) = 9.53$, $p < .001$, CI: 0.70- 1.06. These associations

resulted in a significant indirect effect (*ab*) of stress on cannabis use frequency through Negative Affect Reduction motives, (*b* = .23, CI: .04-.43).

Similar to the PSRS, there was a direct effect (*c'*) of BDEFS Emotion Regulation on cannabis use frequency, *b* = -0.14, *t* (297) = -4.51, *p* < .001, CI: -0.20- -0.08. BDEFS Emotion Regulation was positively associated with Negative Affect Reduction motives, (*a*), *b* = 0.12, *t* (297) = 6.35, *p* < .001, CI: 0.07- 0.14, and cannabis motives were significantly associated with cannabis use frequency, (*b*), *b* = 0.96, *t* (297) = 9.58, *p* < .001, CI: 0.76- 1.16. These associations resulted in a significant indirect effect (*ab*) of BDEFS Emotion Regulation on cannabis use frequency through Negative Affect Reduction motives, (*b* = .10, CI: .07-.15).

Moderated-Mediation Analyses

Gender was not found to moderate the relationship between PSRS stress and Negative Affect Reduction motives, *b* = 0.20, *t* (297) = -0.58, *p* = .56, CI: -0.61- 0.33, or between Negative Affect Reduction motives and cannabis use frequency, *b* = -0.19, *t* (297) = -1.01, *p* = .31, CI: -0.56- 0.18. Similarly, gender did not moderate the relationship between BDEFS Emotion Regulation and Negative Affect Reduction motives, *b* = 0.11 *t* (297) = 1.01, *p* = .31, CI: -0.10- 0.33, or between Negative Affect Reduction motives and cannabis use frequency, *b* = -0.34, *t* (297) = -1.81, *p* = .07, CI: -0.71- 0.03. All interactions examining gender as a moderator of a and b mediational pathways were non-significant.

Given the group mean differences in negative emotionality and negative affect reduction motives, and results of the moderation analyses, a series of post-hoc analyses were conducted to examine whether the positive mediational pathway seen between BDEFS Emotion Regulation on cannabis use frequency though Negative Affect Reduction motives, and PSRS Stress on cannabis use frequency through Negative Affect Reduction motives were notably different when conducted independently with each gender. The results of these

analyses revealed no discernible differences between male and female cannabis users. All pathways remained significant and resulted in similar confidence intervals.

Discussion

This study examined the relationship between negative emotionality, cannabis cognitions, and cannabis use frequency amongst a community sample of adult male and female cannabis users. Furthermore, this study contributed to the understudied area of gender differences relevant to these aforementioned variables. Through a moderated mediational model, the extent to which cannabis cognitions could mediate the relationship between negative emotionality and cannabis use frequency was tested, followed by whether gender moderated the identified mediational relationships.

Gender Differences in Cannabis Use Patterns

Frequency of Cannabis Use, Age of Onset, and Age of Regular Use: Results of initial group analyses examining cannabis use patterns among male and females showed that cannabis users of both genders demonstrated largely similar rates of cannabis use patterns, with the exception that male cannabis users reported significantly more attempts to quit cannabis than females. The finding that male cannabis users have attempted to quit cannabis more frequently is consistent with previous research findings (Boden et al., 2013). However, the similar patterns demonstrated between male and female's frequency of cannabis use, age of onset, and age when regular use commenced, is inconsistent with traditional gender trends of cannabis use patterns (Sherman et al., 2017; Terry-McElrath et al., 2009).

Cannabis use frequency has traditionally been demonstrated at higher rates for males and they have tended to begin using at a younger age compared to females (McHugh et al.,

2018). A number of more recent studies however, have found that female rates of use have increased to match that of male use. (Hayaki, Hagerty, et al., 2010; Lee et al., 2006). Furthermore, the results of the current study suggest that this increase is not just limited to the adolescent age group, demonstrating that adult female cannabis users are breaking traditional trends and using cannabis at an increased rate (McHugh et al., 2018). This highlights the need to conduct further research into the changing dynamic of female cannabis use patterns.

The increasing rates that female cannabis users are using cannabis can be explained by changes in traditional gender roles over time, coinciding with changes in cannabis culture (Currin et al., 2018). Lower gender role traditionality defined by women's decreased representation in the workforce and public spaces has been linked with females increasing substance use over time (Currin et al., 2018; McHugh et al., 2018). Moreover, the increasing cultural and political acceptability of cannabis use has seen a number of jurisdictions decriminalise or legalise cannabis use (Currin et al., 2018). This in turn, has reinforced the gradual emergence of increasingly more prevalent permissive and accepting public attitudes towards cannabis use (McHugh et al., 2018). New Zealand is no exception, the country has undergone considerable cultural and political change regarding cannabis use in recent times, having recently passed legislation legalising the medicinal use of cannabis (Ministry of Health, 2020). However, despite females demonstrating increasingly similar cannabis use patterns to males, the findings of this study indicate that female cannabis users experience elevated levels of negative emotionality associated with their cannabis use compared with males. This in turn, is suggestive of their continued experience of increased cannabis related adverse psychosocial consequences (Hayaki, Hagerty, et al., 2010; McHugh et al., 2018; Sherman et al., 2015).

Stress, Irritability and Executive Functioning: Results of this study showed that female cannabis users reported significantly higher rates of stress compared to males. Female cannabis

users were also found to report significantly more difficulties with overall executive functioning in daily life. The areas of particular executive functioning difficulties endorsed by female cannabis users were in the areas of emotion regulation, time management, and organisation. Stress and emotion-regulation were noted to be particularly elevated for females producing the largest effect sizes of all significant results. These results are in support of the current study's hypothesis, suggesting that negative emotionality is associated to a higher degree with female cannabis users compared to males. The gender differences seen in measures of overall executive function, organisation, and time management, are interesting and novel findings. These differences were not examined as they fell outside the focus of this study, however they merit further attention.

The results of the current study suggest that female cannabis users are more at risk of experiencing negative emotionality than males. This is consistent with prior research which has suggested that female cannabis users are more at risk of using cannabis to regulate negative emotions and tend to present to clinical treatment settings with higher levels of emotional problems compared to males (de Dios et al., 2010; Hayaki, Hagerty, et al., 2010). Whether it is that female cannabis users experience heightened negative emotionality before they begin to use cannabis, or that difficulties with emotion regulation become more pronounced once cannabis use is established, could not be ascertained through the current study. Nonetheless, these results demonstrate that negative emotionality is present and relevant to adult, community based, female cannabis users. In other words, the current research results elucidate that negative emotionality is a factor relevant to female cannabis users whose rates of use or psychosocial impairment can be assumed to likely be less severe than what would be found amongst cannabis users recruited from a clinical based setting (Foster, Jeffries, et al., 2016).

Gender Differences in Cannabis Use Motives and Expectancies

Negative Affect Reduction Motives: Results of the current study demonstrated that female cannabis users endorsed Negative Affect Reduction motives significantly more than males. Contrary to prior research and the current study's hypotheses, female cannabis users did not endorse increased Relaxation and Tension Reduction cannabis expectancies compared to males (de Dios et al., 2010).

Considering that female compared to male cannabis users endorsed heightened negative emotionality, endorsing motivations to use cannabis to reduce negative affect is a logical progression of results. This finding is consistent with prior research and theory that supports the association between emotion dysregulation and Negative Affect Reduction cannabis motives for female cannabis users (Buckner et al., 2012; Bujarski et al., 2012; Foster, Jeffries, et al., 2016; McHugh et al., 2018). Confirming the current research hypothesis, results suggest that the relationship between negative emotionality and Negative Affect Reduction motives is particularly relevant to female cannabis users compared to males.

Previous research has found that cannabis users who endorse coping motives are at greater risk of experiencing psychosocial harm associated with their use (Brodbeck et al., 2006; Buckner, 2013; Foster, Jeffries, et al., 2016). Thus, the current research results suggest that female cannabis users represent a group who may be more susceptible to adverse psychosocial harm associated with their use, due to their tendency to be motivated to use cannabis to alleviate negative affect. In light of these findings, preventative and treatment initiatives could benefit from tailoring interventions to focus on emotion regulation strategies particularly for females (Bujarski et al., 2012; Hayaki, Hagerty, et al., 2010).

Expectancies and Motives Relevant to Male Cannabis Users: Contrary to research hypotheses, male cannabis users did not endorse increased expectancies related to Perceptual

and Cognitive Enhancement or Cognitive Enhancement motives. This is in contrast with other research that has demonstrated male cannabis users tend to endorse these motives and expectancies related to their cannabis use more than females (McHugh et al., 2018). The lack of significant findings in this area in the current study could be explained by the sample being comprised of adult community-based cannabis users. Furthermore, expectancies and motives are fluid and changeable, influenced by age, cultural trends, as well as where on the trajectory a cannabis user finds themselves between initial and established use. Therefore, it may be that Perceptual and Cognitive Enhancement expectancies and Cognitive Enhancement motives are less relevant to adult male cannabis users in the community, and perhaps more relevant to the adolescent developmental stage or samples recruited from clinical populations (Foster, Jeffries, et al., 2016) .

Mediation Analysis

Based on the significant results established between negative emotionality, as measured by stress and emotion regulation deficits, and increased cannabis use frequency, several mediation analyses were conducted to examine to what extent Negative Affect Reduction motives explained the above associations for male and female cannabis users in the study.

Interestingly, the results of the mediation analysis revealed that negative emotionality was negatively associated with cannabis use frequency. This suggests that cannabis users who used cannabis at a higher frequency experienced decreased rates of stress. This result was inconsistent with research hypotheses and an unanticipated finding considering the previous literature that suggests a positive association between negative emotionality and increased cannabis use frequency (Bonn-Miller et al., 2008; Brodbeck et al., 2006; McHugh et al., 2018).

Potential reasons for this result could include that the research sample comprised of community-based cannabis users rather than cannabis users recruited from a clinical setting.

Community based cannabis users are assumed to more likely be higher functioning than cannabis users recruited from clinical settings who may experience increased adverse psychosocial effects associated with their cannabis use (de Dios et al., 2010). Therefore, the result of the current study could reflect the decreased levels of adverse effects associated with cannabis use amongst a community-based sample (Foster, Jeffries, et al., 2016) In contrast, it is argued that amongst a clinical based sample of cannabis users, where a large proportion of research on this topic has been conducted, would be more likely to demonstrate an association between increased cannabis use frequency and higher levels of negative emotionality (Foster, Jeffries, et al., 2016).

Despite the negative relationship observed between stress levels and cannabis frequency, a positive mediational pathway was revealed where negative emotionality was positively associated with Negative Affect Reduction motives. Negative Affect Reduction motives, in turn, were positively associated with cannabis use frequency. These results confirm a positive pathway between negative emotionality, negative affect reduction motives, and increased cannabis use frequency. This result suggests that both male and female cannabis users who endorse negative emotionality, as well as negative affect reduction motives, tend to use cannabis at an increased frequency. This result is consistent with previous research that has established that the relationship between negative emotionality and increased cannabis use related problems is mediated by negative affect coping motives (Bujarski et al., 2012).

The postive mediational pathway identified between negative emotionality cannabis use frequency through Negative Affect reduction motives is consistent with the Acquired Preparedness Model (APM; Smith et al.), suggesting that difficulties with emotion regulation may represent a predisposed increased likelihood of acquiring negative affect reduction cannabis cognitions, which in turn, lead to increased cannabis use frequency. Further research

into this novel application of the APM mediational pathway between negative emotionality, negative affect cognitions, and cannabis use behaviour is warranted and has the possibility of informing treatment and prevention efforts.

Moderated - Mediation Analysis

As gender differences were seen in measures of negative emotionality as well as negative affect reduction motives, it was surprising that gender was not found to moderate the association between negative emotionality and Negative Affect Reduction motives, or the association between motives and cannabis use frequency. The lack of significant findings regarding gender differences is contrary to the current research hypotheses and were unexpected considering the significant gender differences found between negative emotionality and negative affect reduction motives in prior research studies (Bujarski et al., 2012; Simons et al., 2000).

In contrast with the non-significant results, previous research by Bujarski et al. (2012) found that coping motives mediated the relationship between distress intolerance and increased cannabis related problems, and that coping motives had a more powerful mediation effect for female cannabis users than males. However, a notable difference between the current study and that by Burjarski et al. (2012), is that the focus was cannabis related problems rather than cannabis use frequency. This would likely explain the contrast in finding between the two studies. Overall, the results of the current study do show important gender differences in negative emotionality and Negative Affect Reduction motives however the moderation analysis shows that the pathway from negative emotionality to increased cannabis use frequency through negative affect reduction motives remains the same for both community based male and female cannabis users.

Limitations and Future Research Considerations

This study should be considered in light of limitations that can inform future research directions. First, due to the cross-sectional nature of the current study, causal inferences cannot be made and limit the ability to draw conclusions about the consistency of relationships over time. Furthermore, because cannabis use motives and expectancies can change depending on cultural factors, developmental stage, experiences, and length of time using cannabis, future research that considers the trajectory of cannabis use patterns through a longitudinal design would further inform how cannabis cognitions develop in response to these influential factors (McHugh et al., 2018). This in turn, would increase the understanding of the cognitive pathways involved with cannabis use and how they change over time (Hayaki, Hagerty, et al., 2010).

A further limitation relevant to the current study was that all study data was based on self-report. Self-report is common in the research area of substance use cognitions including those for cannabis use, and research indicates that reported cannabis cognitions and effects of the drug are reliably self-reported by samples recruited from both treatment and general populations (Mennes, Ben Abdallah, & Cottler, 2008). However, research that incorporates other data points such as biological verification of cannabis use, and provide multi-informant and collateral reports on relevant outcomes, would strengthen future research designs and subsequent conclusions (Foster, Jeffries, et al., 2016).

Although the current study's recruitment process endeavoured to identify a sample group that represented the general population of community-based cannabis users in New Zealand, the method of survey response required access to the internet and a suitable device. Therefore, it cannot be ruled out that this precluded a proportion of community cannabis users

of lower socio-economic status who may have not had access to the internet or a suitable device to complete the survey.

Finally, the measures incorporated in the current study to assess negative emotionality were based on a measure of stress and executive regulation of emotion in daily life. Future research focussed on the relationship between negative emotionality, cannabis cognitions and cannabis use frequency may benefit from incorporating more comprehensive measures of emotional regulation. Furthermore, the significant results regarding the association between executive functioning deficits, cannabis cognitions, and cannabis use frequency warrant further research investigation from an executive functioning perspective.

Strengths and Concluding Remarks

Despite these limitations, the current study represents an important contribution to the topic of the relationships between negative emotionality, cannabis cognitions, and cannabis use frequency. This study adds to the existing literature by exploring these relationships among an adult sample of community-based cannabis users. The advantage of this includes that research conclusions are more generalised to the community population thus, extending the knowledge base on the topic outside of the clinical setting and the adolescent age group, where the majority of research in the field has been conducted (Benschop et al., 2014; Foster, Buckner, et al., 2016).

The results of the current study are supportive of the changing dynamic of female cannabis use observed in other research studies, characterised by rates of female cannabis use being higher than ever before (de Dios et al., 2010; McHugh et al., 2018). Despite female cannabis users demonstrating similar use patterns to males, the current research suggests that negative emotionality is more implicated with female cannabis use than males. The potential vulnerability to adverse cannabis related consequences this poses for female cannabis users

highlights the importance of further research into this area (Sherman et al., 2017). Such research can inform treatment and preventative initiatives by ensuring they remain in line with contemporary trends relevant to gender specific cannabis use cognitions and outcomes.

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Appendices

Appendix A: Advertising Poster

Appendix B: Demographic Questions

Please complete the items below.

1. **Gender:** M F Other (Please specify) _____

2. **What is your age?**

18-24 years old

25-34 years old

35-44 years old

45-54 years old

55-64 years old

65-74 years old

75 years or older

3. **Please indicate which ethnic group or groups you belong to:**

- New Zealand European
- Māori
- Samoan
- Cook Islands Maori
- Tongan
- Niuean
- Chinese
- Indian
- Other: Please indicate: eg Dutch, Japanese, Tokelauan
  _____

4. **What is the highest degree or level of school you have completed? If currently enrolled, highest degree received.**

- No schooling completed
- Preschool to year 8 / Intermediate
- Some high school, no NCEA / School Certificate
- NCEA Level 1 / School Certificate Some college credit, no degree
- NCEA Level 2 / Sixth Form Certificate

- NCEA Level 3 / Bursary / University Entrance or the equivalent
- Some tertiary credit, no degree
- Trade/technical/vocational diploma
- Associate degree
- Bachelor's degree
- Master's degree
- Professional degree
- Doctorate degree

5. **Current Employment Status: check all that apply**

Employed for wages part-time

Employed for wages full- time

Self-employed

Out of work and looking for work

Out of work but not currently looking for work

A homemaker

A student

Military

Retired

Unable to work

6. **What is your marital status?**

Single, never married

Married or domestic partnership

Widowed

Divorced

Separated

Appendix C: Substance Use Questions

7a. **Do you currently smoke cigarettes?** No Yes

b. **If yes, please indicate your current rate of smoking**:

1. Weekly, but not every day
2. Daily, but less than one cigarette a day
3. Between one and five cigarettes a day
4. About ½ a pack a day
5. About 1 pack a day
6. Greater than 1 pack a day

8a. **Do you currently drink alcohol?** No Yes

b. **If yes, please indicate your current rate of drinking:**

1. Less than once a month
2. 1-3 times a month
3. Once a week
4. Twice a week
5. Greater than two times a week
6. Every day

9a**. Do you currently smoke marijuana?** No Yes

b. If yes, please indicate your current rate of marijuana use:

1. Less than once a month
2. 1-3 times a month
3. Once a week
4. Twice a week
5. Greater than two times a week
6. Every day

10a. **Do you currently use any other recreational drugs?** No Yes

b. **If yes, please indicate your current rate of other recreational drug use**:

1. Less than once a month
2. 1-3 times a month
3. Once a week
4. Twice a week
5. Greater than two times a week
6. Every day

11. **How old were you when you first smoked marijuana?** (years)

12. **How many years have you smoked marijuana?** (total number of years)

13. **Would you describe yourself as a regular marijuana user?** No/ Yes

14. **How old were you when you started regular marijuana smoking?** (years; NA)

15. **How many times in your life have you made a serious attempt to quit using marijuana?** (0-9, If more than 9 times, put 9)

Appendix D: Research Volunteer Consent Form

Department: Psychology
Telephone: +64 33692633
Email: seth.harty@canterbury.ac.nz
Date: 24/08/2017

Measurement of Marijuana Enhancement Expectancies (MMEE) Consent Form for Research Volunteers

VOLUNTARY PARTICIPATION

By signing this document you demonstrated your understanding that your participation in this study is entirely voluntary. Refusal to participate will involve no penalty or loss of benefits to you. You are free to withdraw or refuse consent, or to discontinue my participation in this study at any time without penalty or consequence.

- ☐ I have been given a full explanation of this project and have had the opportunity to ask questions.
- ☐ I understand what is required of me if I agree to take part in the research.
- ☐ I understand that participation is voluntary and I may withdraw at any time without penalty. Withdrawal of participation will also include the withdrawal of any information I have provided should this remain practically achievable.
- ☐ I understand that any information or opinions I provide will be kept confidential to the researcher and research team involved in this study and that any published or reported results will not identify the participants.
- ☐ I understand that all data collected for the study will be kept in locked and secure facilities and/or in password protected electronic form and will be destroyed after ten years.
- ☐ I understand the risks associated with taking part and how they will be managed.
- ☐ I understand that I can contact the researcher Seth Harty, PhD for further information. If I have any complaints, I can contact the Chair of the University of Canterbury Educational Research Human Ethics Committee, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz)
- ☐ I would like to opt into the chance to win one of three $100.00 dollar gift cards
- ☐ I would like a summary of the results of the project.
- ☐ By signing below, I agree to participate in this research project.

Signature/Email address: _____

Appendix E: Research Volunteer Information Sheet

Department: Psychology
Telephone: +64 33692633

Email: seth.harty@canterbury.ac.nz

Date: 24/08/2017

Measurement of Marijuana Enhancement Expectancies (MMEE)

Information Sheet for Research Volunteers

You are invited to participate in a research study conducted by Seth Harty, PhD. Dr. Harty is a faculty member in the Department of Psychology. He is interested in marijuana use, the benefits people perceive from marijuana use, and the events that influence people's desire to use marijuana.

Please read the information below which outlines what is involved in this research study. If you would like to complete this study, which will take approximately 15-20 minutes, you can give your consent by ticking the consent box below. By taking part in this study you will have the opportunity to enter into a lucky draw, to be conducted at the end of the study, for a chance to win one of three $100.00 gift cards.

PURPOSE OF THE STUDY

The MMEE study seeks to explore the properties of two questionnaires created by the primary researcher that measure reported marijuana use in response to environmental events and the beliefs individuals have regarding the effect marijuana has on cognitive, emotional, and behavioral processes.

PROCEDURE

If you choose to take part in this study, your involvement will be as a research volunteer. If you agree to participate in the study you will digitally sign a form giving your consent. You will then complete a series of self-report forms that measure your substance use, your beliefs about marijuana use, and your general psychological function. The questionnaire should take approximately 15 minutes to complete.

POTENTIAL RISKS AND DISCOMFORTS

This study protocol may involve some minor discomfort. As we are asking questions about behaviors that are illegal, there may be some discomfort around individual disclosure of information. While this study requires that participants provide some identifying information in the form of an email address, this study holds that information in confidence and will never share

your information. If, during the course of this experiment, you wish to stop, you can stop at any time with no negative consequence.

BENEFITS

Although there are no immediate benefits, your participation is important as it helps the scientific community better understand this topic of study. After signing the consent form and as a demonstration of our appreciation, you can choose to take part in a lucky draw for the chance to win one of three $100.00 dollar gift cards. The drawing will take place at the end of study recruitment and winners will be notified through the email address provided in the consent.

CONFIDENTIALITY

The researchers are very mindful of the need to protect participants' interests. Any information that you provide will be treated as confidential. Only the principal researcher and named co-investigators, who have signed a formal confidentiality agreement, will have access to the raw data, which will be destroyed after ten years. Your name will not be linked to your questionnaire report or performance on experimental measures. Under no circumstances will any data you supply be disclosed to a third party in any way that could reveal who the source was. The study data will be stored on password-protected computers and locked file cabinets in secured locations in the University of Canterbury Psychology Department.

The results of the project may be published, and as this research involves confidential questionnaires you can be assured that your name or identifying information will not be revealed in any reports or publications generated by this study.

PARTICIPATION AND WITHDRAWAL

Participation is voluntary and you have the right to withdraw at any stage without penalty. You may ask for your raw data to be returned to you or be destroyed at any point. If you withdraw, information relating to you will be removed. However, once analysis of raw data starts it will become increasingly difficult to remove the influence of your data on the results.

You may receive a copy of the project results by checking the appropriate box bellow.

The project is being carried out by Seth Harty, PhD, who can be contacted at seth.harty@canterbury.ac.nz. He will be pleased to discuss any concerns you may have about participation in the project.

This project has been reviewed and approved by the University of Canterbury Educational Research Human Ethics Committee, and participants should address any complaints to The Chair, Educational Research Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

If you agree to participate in the study, you are asked to complete the following consent form.